

### **PDRC Highlights**



- Potential to assist in tactical departure clearances impacting metered airports
  - Over 30,000 aircraft per month will get improved departure clearances into constrained overhead/enroute flows
  - 22% of arrival aircraft will have significantly improved arrival meter schedules

### **PDRC Highlights**

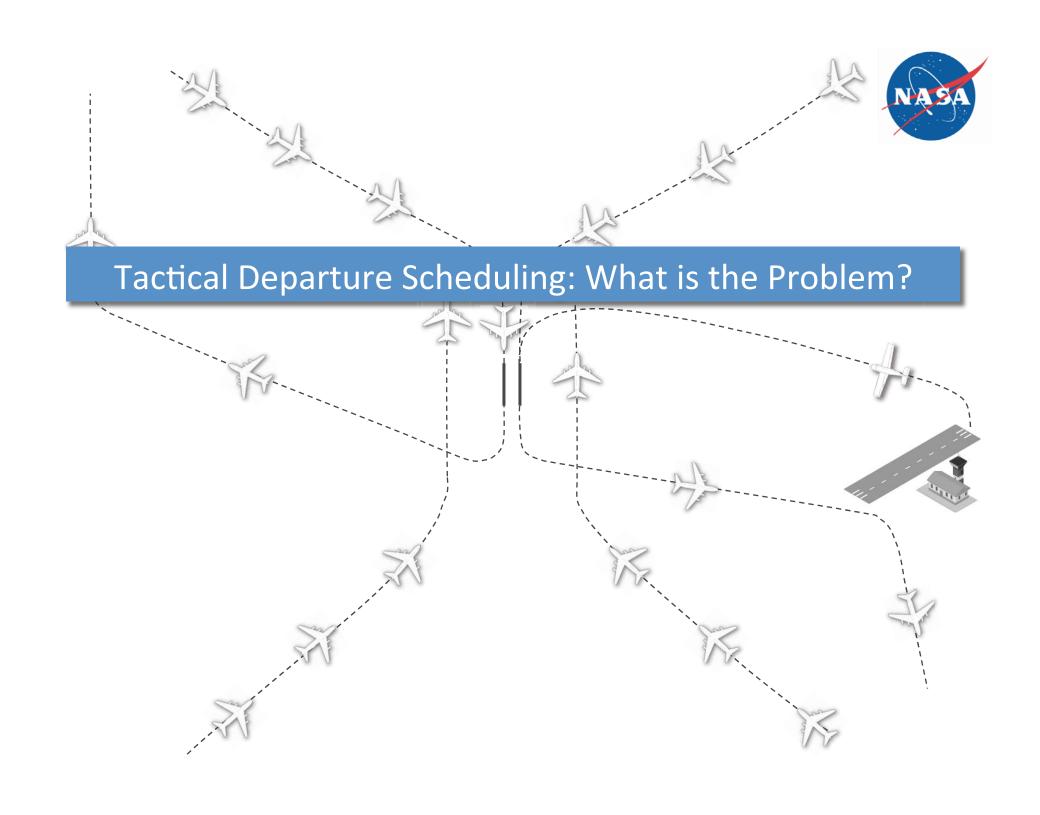


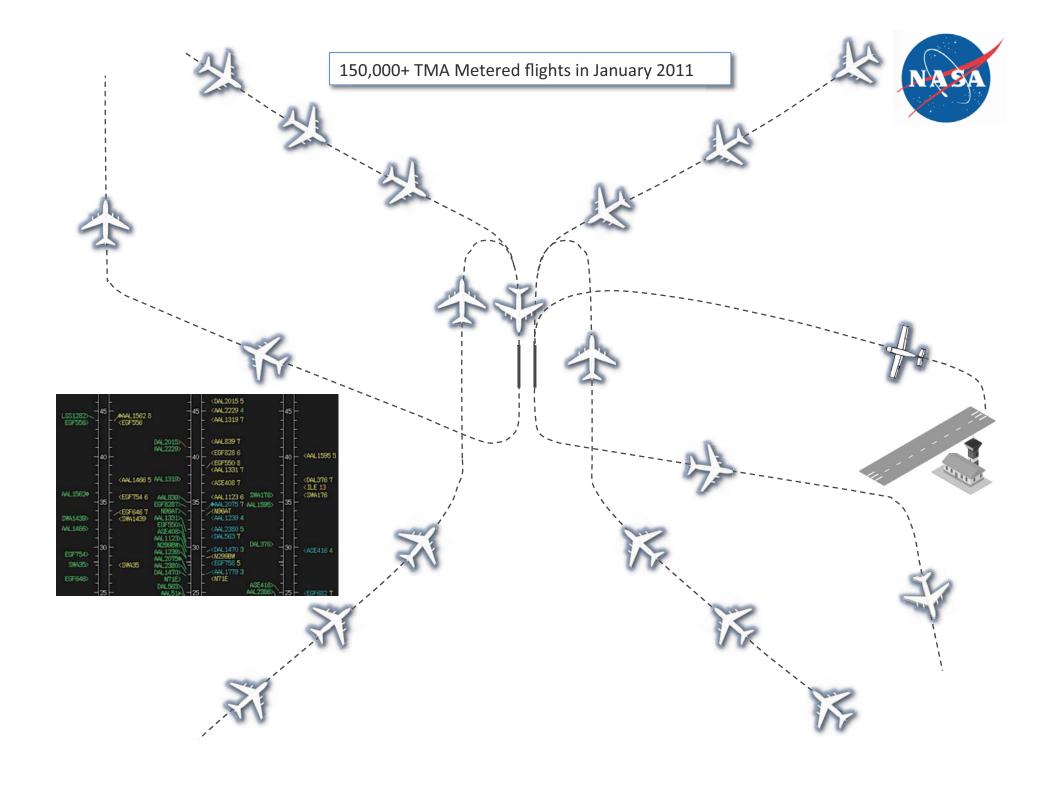
- Potential to assist in tactical departure clearances impacting metered airports
  - Over 30,000 aircraft per month will get improved departure clearances into constrained overhead/enroute flows
  - 22% of arrival aircraft will have significantly improved arrival meter schedules
- A field-validated automation tool leveraged off existing FAA systems (TMA and SDSS)
  - OFF Time compliance improvement from 54% to 83%
  - Nearly a 1-minute improvement in both mean and standard deviation of OFF Time predictability

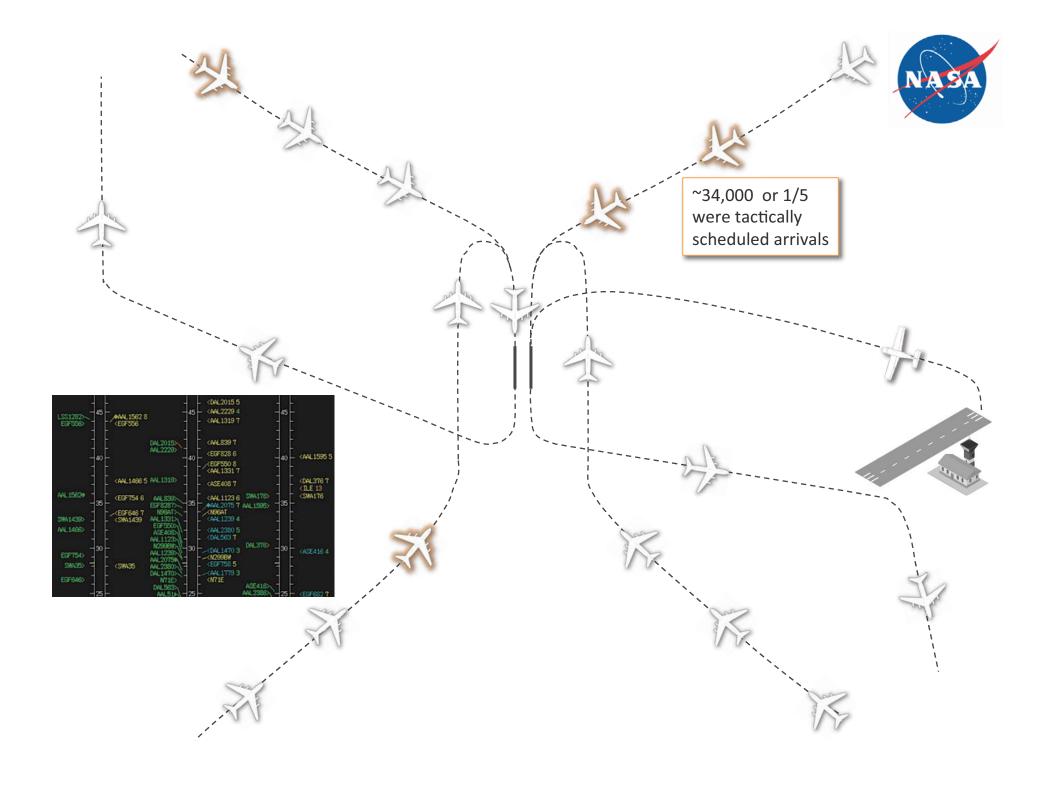
### **PDRC Highlights**

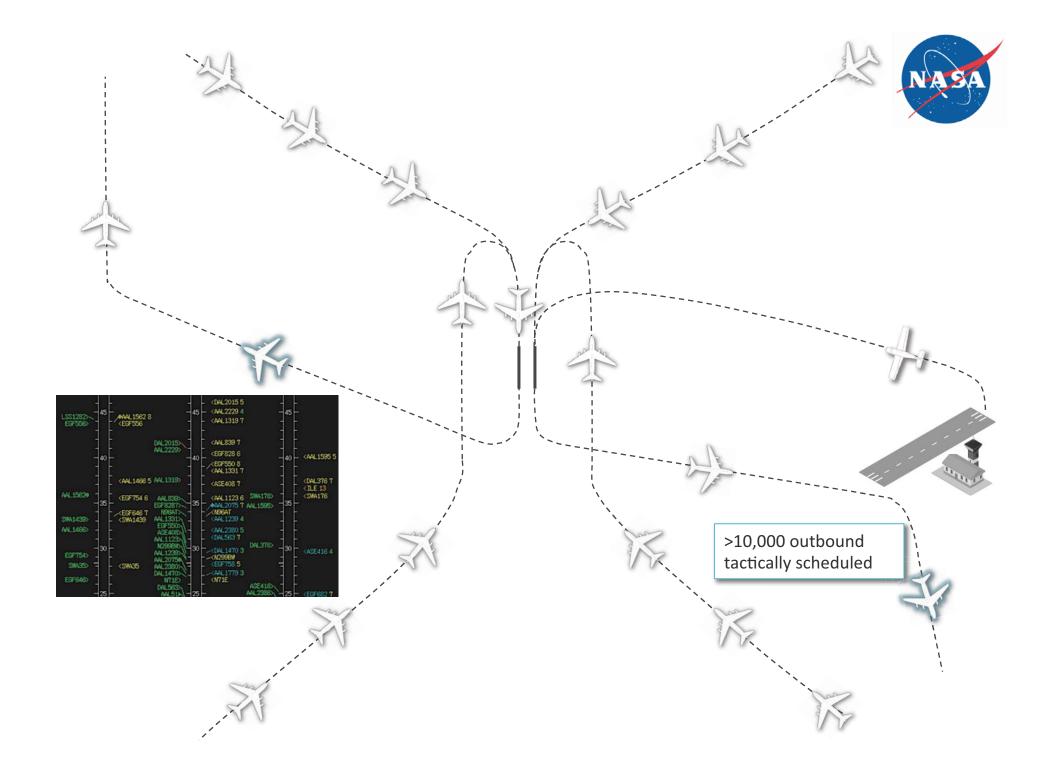


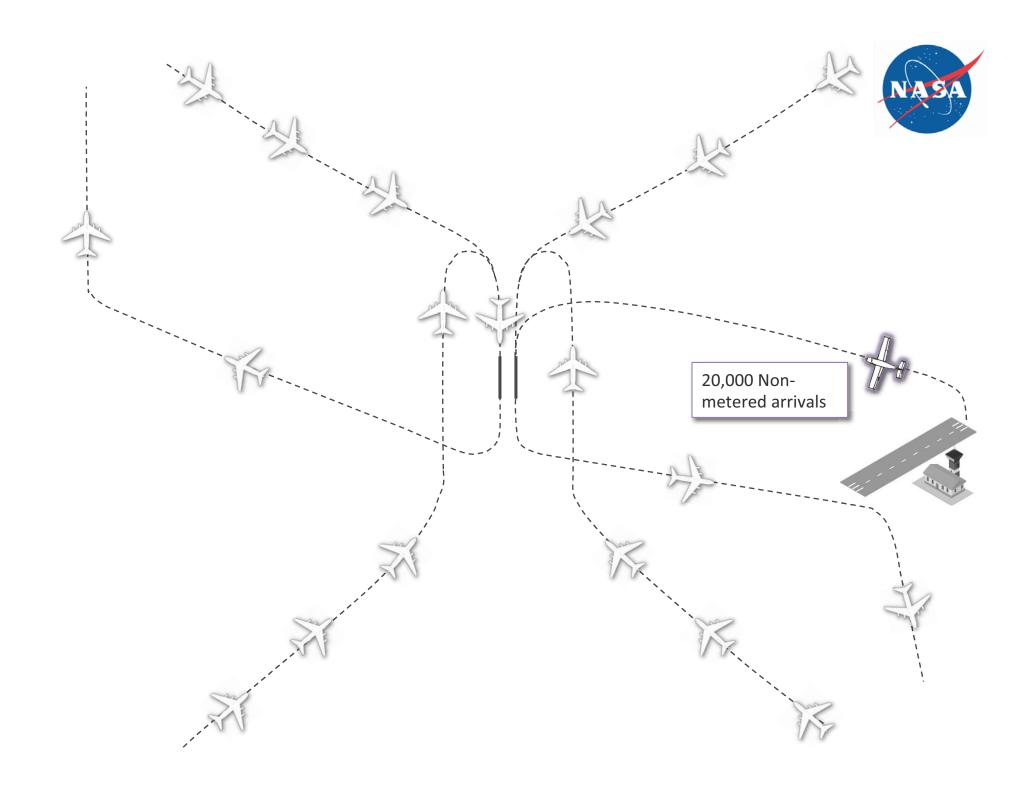
- Potential to assist in tactical departure clearances impacting metered airports
  - Over 30,000 aircraft per month will get improved departure clearances into constrained overhead/enroute flows
  - 22% of arrival aircraft will have significantly improved arrival meter schedules
- A field-validated automation tool leveraged off existing FAA systems (TMA and SDSS)
  - OFF Time compliance improvement from 54% to 83%
  - Nearly a 1-minute improvement in both mean and standard deviation of OFF Time predictability
- Concept of Operations, Technology Description and Operational Evaluation results all handed over to the FAA

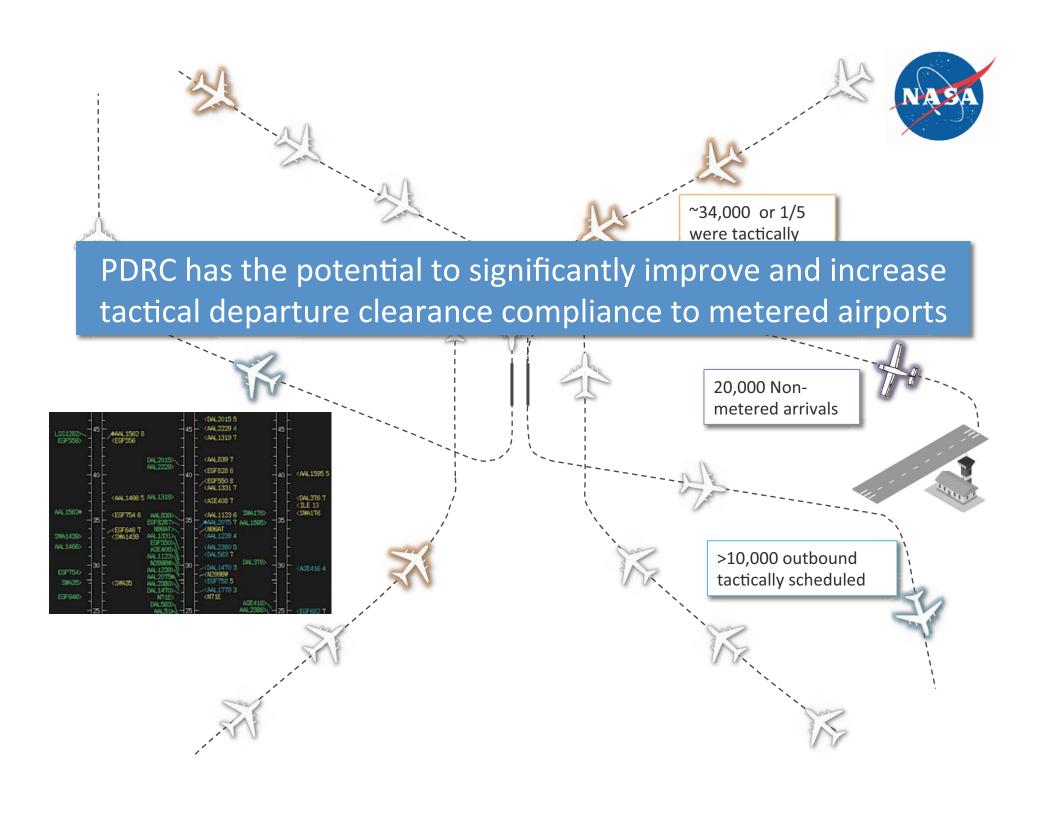












## **Today's Departure Operations**









### **Technology Imbalance**

En route trajectory-based decision support tool develops tactical departure schedules using...

Substitute Reporters

With Control of the Control o

TRACON

**ARTCC** 

Manually-computed OFF time predictions



### **Today's Departure Operations**





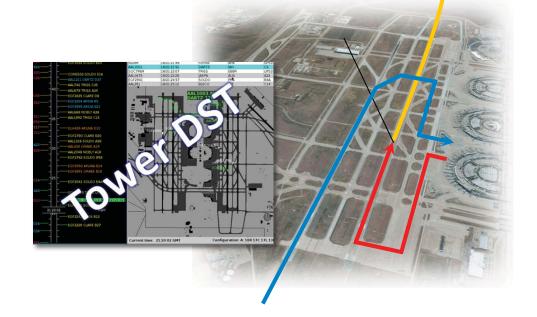




### **Technology Imbalance**

ARTCC **TRACON** 

Can be addressed with information from NextGen surface trajectory-based operations tools



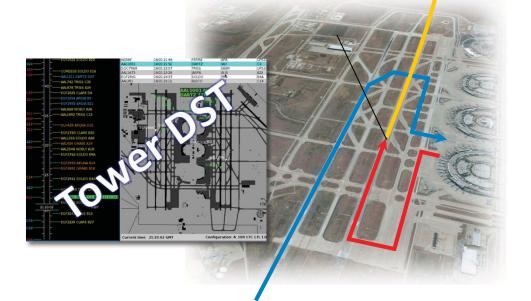
## **PDRC Concept Overview**

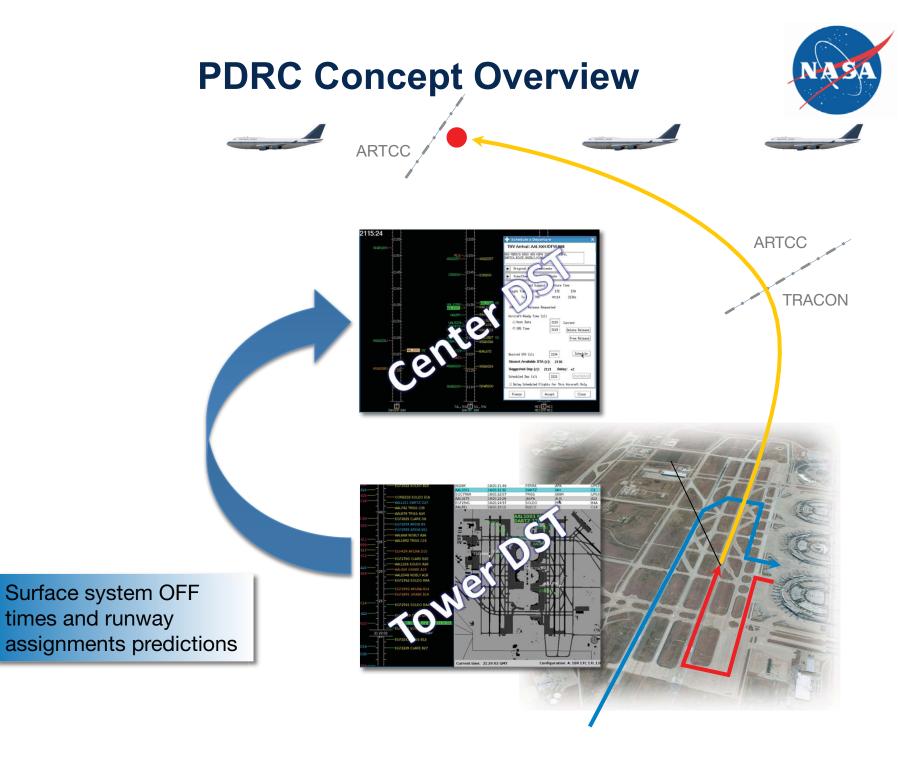












## **PDRC Concept Overview**





ARTCC

Communication of assigned OFF times and more accurate departure scheduling

2115-24

Substitute 3 beginning

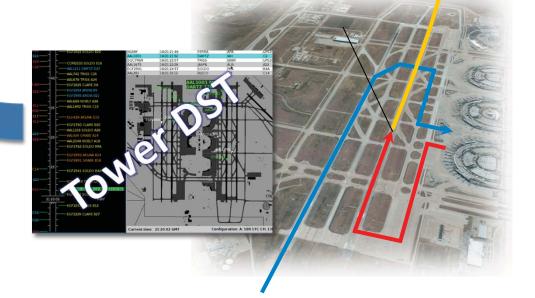
TIN Arrival: Aut 10010TV Aga

Substitute 3 beginning

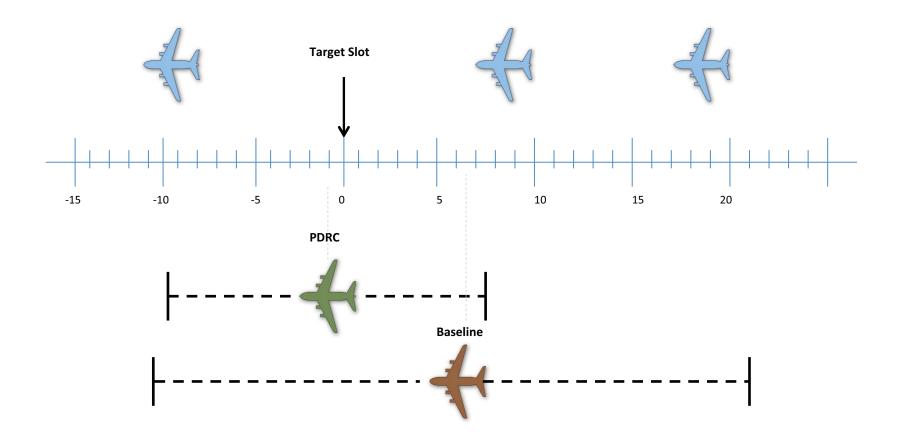
Substitute 4 be

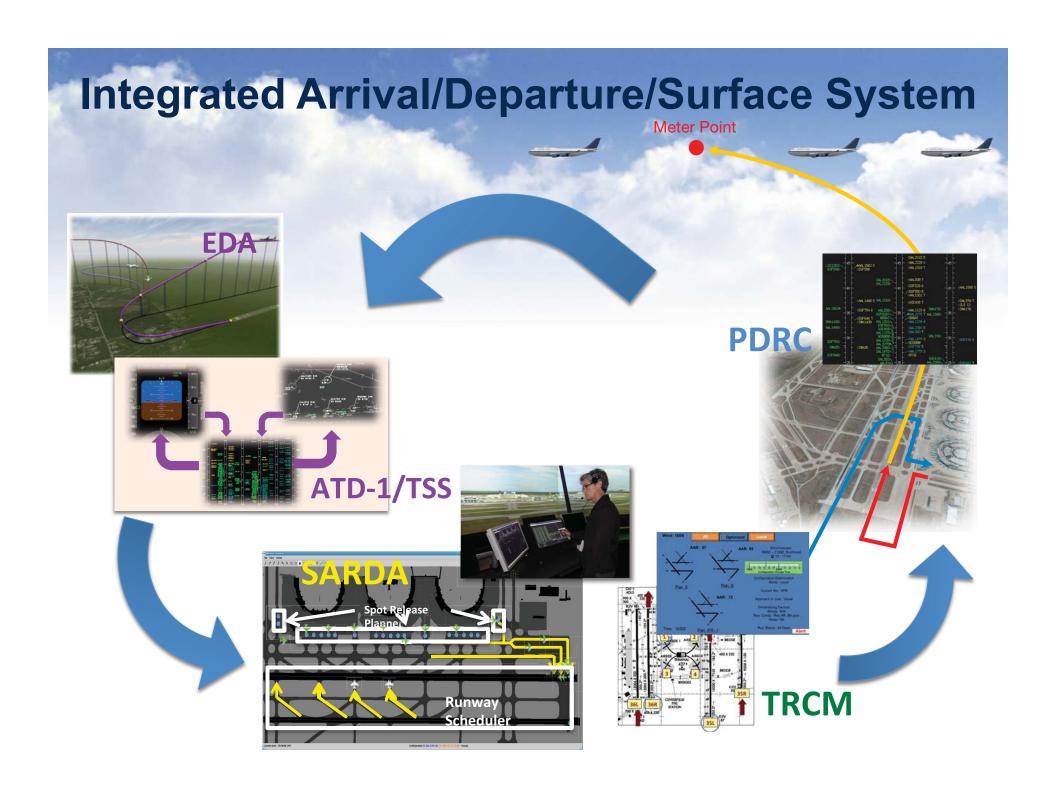
ARTCC

Surface system OFF times and runway assignments predictions



# Improved Ability to Fit into Overhead Stream





### **IADS** Research Transition Team



- NASA and FAA established the Research Transition Teams to ensure NASA's NextGen R&D products are identified, quantified, and effectively transferred to the FAA.
- Key PDRC events in coordinating transition of NASA research products

<ul> <li>Jun 2009 NASA initiated PDRC re</li> </ul>	esearch activity
---	------------------

Sep 2009
 PDRC product defined in IADS RTT plan

Sep 2010PDRC TIM @ NASA Ames

Mar 2011 PDRC briefing and demo at ASP TIM

Nov 2011 PDRC stakeholder update @ FAA HQ

Jun 2012 preliminary PDRC tech transfer

Jun 2013 final PDRC tech transfer

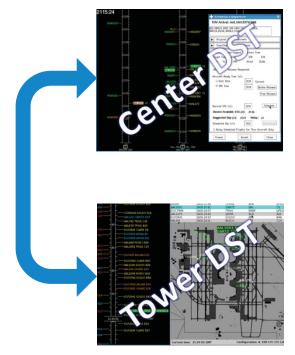
- Represented by:
  - NASA NextGen SAIE Project
  - FAA NextGen organization (ANG) and Air Traffic Organization (ATO)
- Next meeting August 7<sup>th</sup> to discuss selected IADS RTT efforts.

### **Prototype System Overview**



#### **Traffic Management Advisor (TMA)**

- 1997 NASA → FAA tech transfer
- FAA further developed and deployed throughout the NAS



#### **Surface Decision Support System (SDSS)**

- 2004 NASA → FAA tech transfer
- NASA and FAA use for NextGen surface research and TFDM development

### **Prototype System Overview**

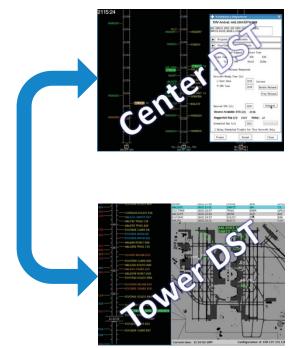


#### **Traffic Management Advisor (TMA)**

- 1997 NASA → FAA tech transfer
- FAA further developed and deployed throughout the NAS

#### **PDRC** enhancements

- Two-way data exchange between tools
- Enable use of surface information (predicted runway and OFF time) in TMA departure scheduling
- Automate Center/Tower release time coordination
- Departure prediction improvements for both TMA and SDSS



#### **Surface Decision Support System (SDSS)**

- 2004 NASA → FAA tech transfer
- NASA and FAA use for NextGen surface research and TFDM development

### **NASA/FAA Collaboration**

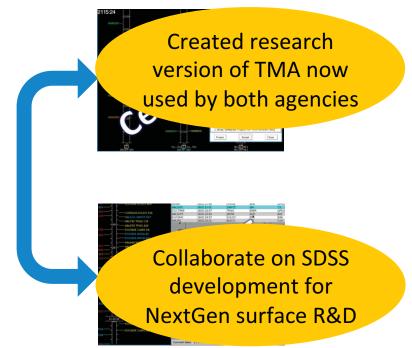


#### **Traffic Management Advisor (TMA)**

- 1997 NASA → FAA tech transfer
- FAA further developed and deployed throughout the NAS

#### **PDRC** enhancements

- Two-way data exchange between tools
- Enable use of surface information (predicted runway and OFF time) in TMA departure scheduling
- Automate Center/Tower release time coordination
- Departure prediction improvements for b Tactical surface data
  - exchange (TSDE) air



#### **Surface Decision Support System (SDSS)**

- 2004 NASA → FAA tech transfer
- NASA and FAA use for NextGen surface research and TFDM development

## **PDRC Operational Evaluations**



### Objectives

- Validate PDRC concept
- Demonstrate system performance





### **PDRC Operational Evaluations**



#### Objectives

- Validate PDRC concept
- Demonstrate system performance

#### **Environment and Methodology**

- DFW Tower and Fort Worth Center TMU
- Operational flights subject to Call For Release
- Use PDRC for OFF time predictions, scheduling and release time coordination





### **PDRC Operational Evaluations**



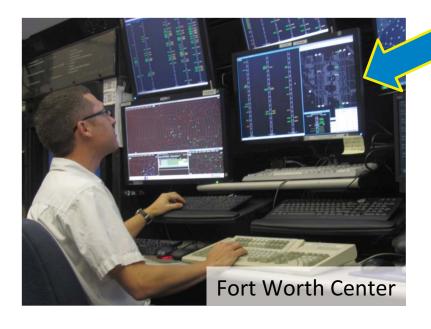
#### Objectives

- Validate PDRC concept
- Demonstrate system performance

#### **Environment and Methodology**

- DFW Tower and Fort Worth Center TMU
- Operational flights subject to Call For Release
- Use PDRC for OFF time predictions, scheduling and release time coordination

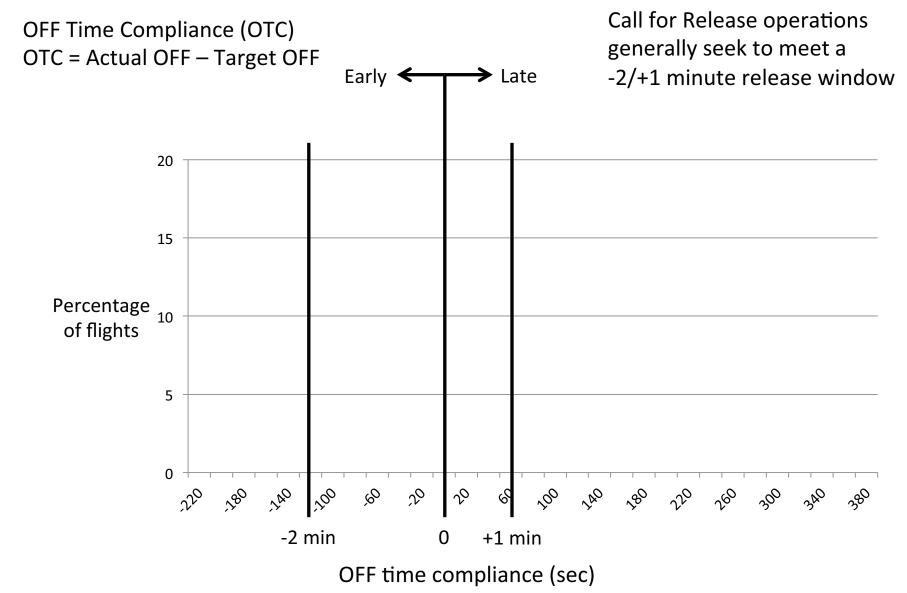




#### Summary

- Two phase evaluation over 29 weeks
   May 2012 Jul 2012 120 flights
   Nov 2012 Feb 2013 118 flights
- Block 2 includes new versions of SDSS and TMA plus adaptation upgrades

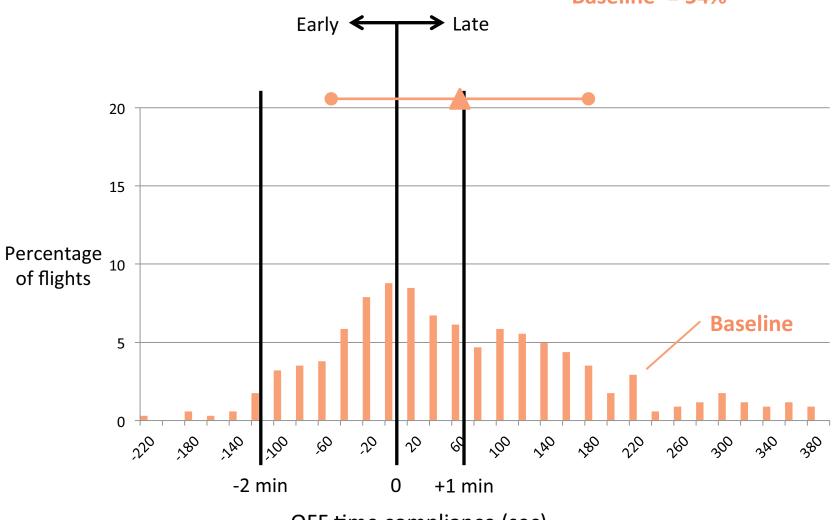






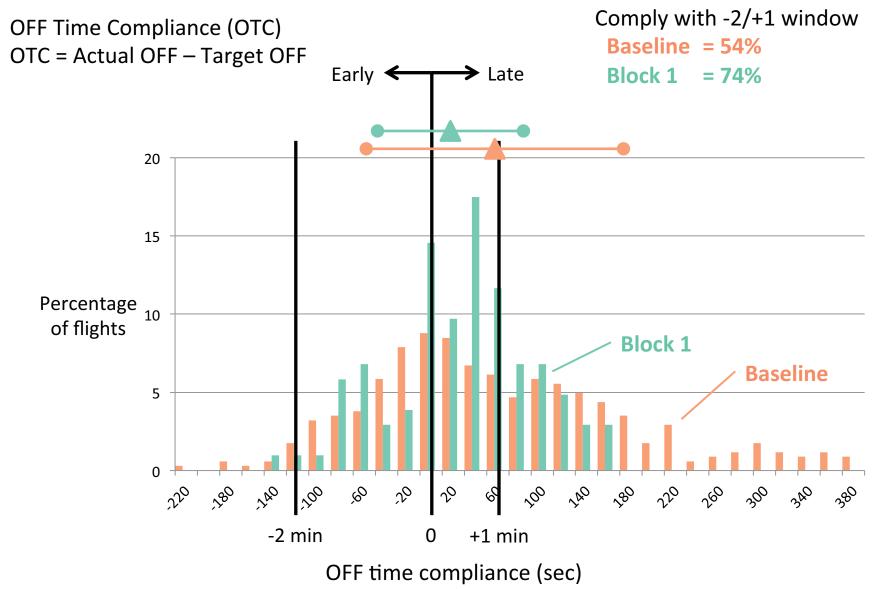
Comply with -2/+1 window

Baseline = 54%

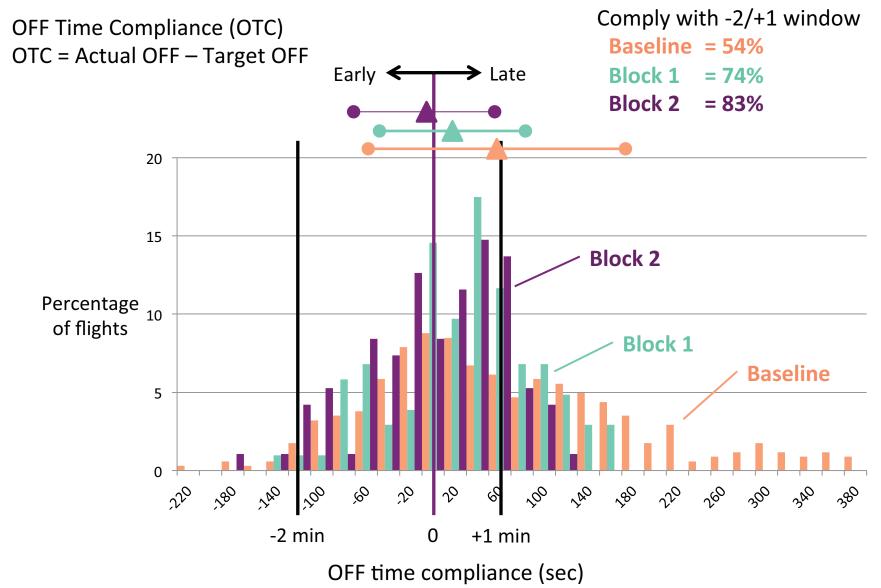


OFF time compliance (sec)



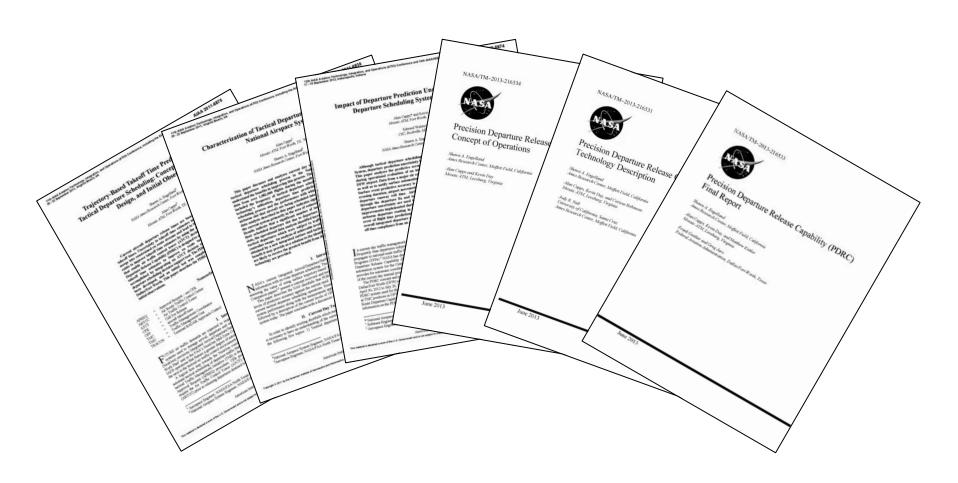






### **PDRC Research Products**





### **PDRC Research Products**



- Characterize NAS-wide tactical departure operations
- Analyze uncertainty in tactical departure operations
- Preliminary Concept and Technology Description
- Concept of Operations
- Technology Description
- Operational evaluation results

### **NASA/FAA** Research Partnerships



- FAA NextGen organization (ANG)
  - Facilitated tech transfer via Research Transition Team
  - Joint development of Surface Decision Support System
  - Supported enhancements to TMA
  - Collaborated on two-way air carrier interface
- FAA Air Traffic Organization (ATO)
  - Provided input on PDRC development and evaluation plans
  - Active, ongoing dialogue to ensure successful research transition
  - DFW TRACON (D10) and Fort Worth Center (ZFW) test/eval



Key to success was jointly defining what the "baton" needed to be and where the exchange was to occur.

### **Next Steps**



PDRC is complete

New work will be planned within the IADS RTT

 Future tactical departure scheduling research builds on the PDRC foundation

